SYNTHESIS, CHARACTERIZATION AND APPLICATIONS OF FEW SUPRAMOLECULAR METAL-ORGANIC MATERIALS

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Introduction

Nature admires Supramolecular interactions. Supramolecular chemistry is defined as chemistry beyond the molecule.[1, 2] Supramolecular Chemistry explores interactions between the molecules relatively than within the molecules and concentrate on the chemical systems assembled through non-covalent types of interactions e.g. hydrogen bonding, π···π, lone pair···π , van der Waals forces, different weak interactions like hydrophobic and electrostatic interactions etc. Supramolecular chemistry includes host-guest chemistry[3], self-assembly[4] and molecular recognition[5] processes

Metal ions perform a crucial role in supramolecular systems for self-assembly.[6]

The design and synthesis of such crystalline materials through the self-assembly of molecular building blocks and the search of functional materials based upon this approach are usually classified under the banner of ***Crystal Engineering***.

Crystal Engineering explores the molecular building blocks of self-assembled crystalline material and depends on coordinate/covalent forces or weak non covalent interactions hydrogen bonding, π···π interaction, C–H···π interaction etc [7-15]

Aromatic interactions like interactions consist of π–π, anion–π, cation–π, lone pair–π, etc. play a major role in crystal engineering.

The Biological phenomena is influenced by π–π interactions and these interactions can be used to stabilize ions of double helical structure of DNA[16] .

Aims and Objectives:

1. To prepare coordination complexes of transition metal ions with some selective mono/di/tri/tetra-carboxylic acid.
2. To study and exploration of versatile metallosupramolecular networks i.e, metal organic framework (MOFs) through crystal engineering.
3. Characterization of crystalline supramolecular architectures through X-Ray Single Crystal Diffraction method, Thermo gravimetric method, Magnetic study, Photo-physical study, X-Ray Powder diffraction method, CHN analyser etc.
4. I will try to synthesize and characterize several soft materials like metal based hydrogel along with its DNA-hydrogel, enzyme-hydrogel, protein-hydrogel, etc.
5. I will attempt to generate metal nanoparticles and will examine its functionality and bio relevance.

Proposed research Plan:

1. Different transition metal ions like Cu(II), Ni(II), Co(II), Mn(II) will be used for the study in water medium.
2. N,O,S-donor organic aromatic and non-aromatic including cyclic and acyclic ligand will be used for the study.
3. Bipyridine, terpyridine, tetrapyridine ligands will be used.
4. Oxalic acid, EDTA, nitrilotriacetic acid, glycolic acid will be used for this study.
5. Mg(II) ion will also be used for complex formation.
6. pH variation of the reaction mixture will be performed.
7. The several crystal engineering principles will be investigated.
8. The Hirshfeld Surface Analysis will be performed.
9. The fluorometric investigation of the synthesized metal-organic complex will be performed.
10. Molecular sensing and ion detection study will be executed.

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